

**State of Wisconsin DEPARTMENT OF NATURAL RESOURCES**

Jim Doyle, Governor  
Scott Hassett, Secretary  
Ronald W. Kazmierczak, Regional Director

Northeast Regional Headquarters  
Green Bay Service Center  
1125 N. Military Ave., P.O. Box 10448  
Green Bay, Wisconsin 54307-0448  
TELEPHONE 920-492-5794  
FAX 920-492-5913  
TDD 920-492-5912

January 16, 2003

Mr. Donald Brisch  
Rockwell Lime Company  
4110 Rockwood Road  
Manitowoc, WI 54220

FID # 436034390

SUBJECT: Emission Rates from Lime Kiln #2

Dear Mr. Brisch:

Thank you for submitting the results of the November 14, 2002 stack test. The report documents that kiln #2 was operated in compliance with the limits for sulfur dioxide and particulate matter. I have reviewed and summarized the results in the attached Table 1. It includes a slight correction of the reported particulate matter, and selection of the correct (higher) barium emission rate. The results deserve several comments.

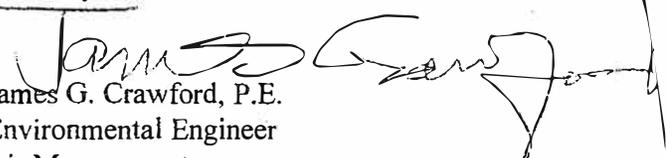
Run #1 of the PM test is invalid and not used in the test average, because the sample volume is less than 30 dscf. But discarding the run lowered the particulate matter average by 25%. In the future, when one of the three runs is known to be invalid on the test day, it should be replaced with a 4<sup>th</sup> run.

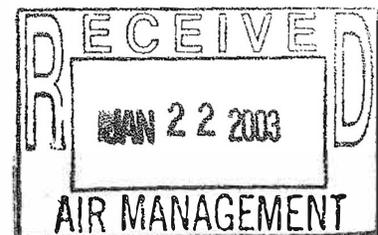
During the test, the kiln was operated at maximum capacity with a blend of 40% coke/60% coal. The feed rate provided a heat input of 70.94 MMBTH. Of the total 87.9 MMBTH heat input, 19% was provided by natural gas (16.98 MMBTH). The heat input from natural gas was similar to that reported in other quarters of 2002.

The metal emission results can be used instead of past tests. However, 3 of the 8 baghouse compartments were isolated during the test. Does the opacity CEM indicate that these compartments showed higher opacity, prior to testing, than the others? If the isolated compartments were leaking dust, metal results could be orders of magnitude higher. This would warrant a retest for metals when the operating permit is issued, with both kilns and all compartments operating.

I look forward to receiving the stack test plan for the upcoming optimization stack tests.

Sincerely,

  
James G. Crawford, P.E.  
Environmental Engineer  
Air Management



cc: ENF - AM/7



TABLE 1. WDNR SUMMARY OF EMISSION RESULTS FROM STACK TESTS ON LIME KILN #2, S11, P36, ROCKWELL LIME COMPANY, MANITOWOC, WI.

updated 1/2/03

Kiln #2 Stack Test Dates	Particulate Matter and Other Pollutants PM value used to compare with limit is in <b>bold</b> .			Stack Gas  ACFM O <sub>2</sub> Temp. Opacity	Baghouse Base Inlet Pressure Range and Average Inches wc	Baghouse Module Press. Drop Range, Average Inches wc	Time Between Cleaning of Each Module (TBC) Minutes & Mod. Off
	lb/hr	lb/ton stone <b>LIMIT</b> = 0.3 lb/ton	lb/ton lime produced				
11/14/02 runs <u>2, 3</u>  front-half PM	2.7  0.06 2%	<b>0.11</b>  0.0003	0.22  0.0024	51,697 8.3 % 373 °F nr	6 - 6  Avg = 6	2.0 - 3.5  Avg = 2.6	TBC=10  Mod. Off= #3,4,6
11/14/02  metals	Ba 2.79 x10 <sup>-3</sup> Be 2.85 x10 <sup>-6</sup> Pb 1.39 x10 <sup>-4</sup> Mn 1.33x10 <sup>-4</sup> Ni 5.98x10 <sup>-4</sup>	Ba 1.13 x10 <sup>-4</sup> Be 1.16 x10 <sup>-7</sup> Pb 5.55 x10 <sup>-6</sup> Mn 5.38x10 <sup>-6</sup> Ni 2.42 x10 <sup>-5</sup>	Ba 2.26 x10 <sup>-4</sup> Be 2.32 x10 <sup>-7</sup> Pb 1.11 x10 <sup>-5</sup> Mn 1.08 x10 <sup>-5</sup> Ni 4.84 x10 <sup>-5</sup>	50,673 8.6% 381 °F nr	6 - 6  Avg = 6	2.0 - 3.5  Avg = 2.6	TBC=10  Mod. Off =#3,4,6
11/14/02  NOx  SO2	40.5  194.2	1.67  8.00	3.34  16.0	51,697 8.4% 372 °F nr	6 - 6  Avg = 6	2.0 - 3.5  Avg = 2.6	TBC=10  Mod. Off =#3,4,6
12/21/00 runs <u>1, 2, 4</u>  front-half PM	2.92  0.1 3%	<b>0.12</b>  0.004	0.24  0.008	57,337 10.2 % 366 °F 0-2%	5.7 - 5.9  Avg=5.8	3.1 - 5.1  Avg=3.8	TBC=10  Mod. Off= #2
6/18/99  front-half PM	0.52  0.14 27%	<b>0.021</b>  0.0058	0.042  0.012	49,760 7.2 % 422 °F 1%	6.3 - 7.0  Avg=6.8	3.9 - 5.5  Avg =4.5	TBC=25  Mod. Off= #2,5,7
5/20/99  metals		Ba 9.85 x10 <sup>-6</sup> Be 2.28 x10 <sup>-7</sup> Pb 6.53 x10 <sup>-6</sup> Mn 5.99 x10 <sup>-6</sup> Ni 9.54 x10 <sup>-6</sup>	Ba 1.97 x10 <sup>-5</sup> Be 4.56 x10 <sup>-7</sup> Pb 1.31 x10 <sup>-5</sup> Mn 1.20 x10 <sup>-5</sup> Ni 1.91 x10 <sup>-5</sup>	50,950 7.2% 401 °F nr	6.1 - 6.8  Avg=6.5	3.4 - 5.2  Avg =4.3	TBC=25  Mod. Off =#2,3,8
4/8/99  front-half PM	15.62  9.22 59%	<b>0.59</b>  0.35	1.18  0.70	47,628 9.0 % 375 °F 3%	3.9 - 4.0  Avg=4.0	1.9 - 3.0  Avg =2.3	TBC=11  Mod.Off =#4

Kiln #2 Stack Test Dates	Particulate Matter and Other Pollutants PM value used to compare with limit is in <b>bold</b> .			Stack Gas  ACFM O <sub>2</sub> Temp. Opacity	Baghouse Base Inlet Pressure Range and Average Inches wc	Baghouse Module Press. Drop Range, Average Inches wc	Time Between Cleaning of Each Module (TBC) Minutes & Mod. Off
	lb/hr	lb/ton stone <b>LIMIT</b> = 0.3 lb/ton	lb/ton lime produced				
4/7/99  metals		Ba 5.86 x10 <sup>-5</sup> Be 1.74 x10 <sup>-6</sup> Pb 8.42 x10 <sup>-5</sup> Mn 5.01 x10 <sup>-4</sup> Ni 3.14 x10 <sup>-2</sup>	Ba 1.17 x10 <sup>-4</sup> Be 3.48 x10 <sup>-6</sup> Pb 1.68 x10 <sup>-4</sup> Mn 1.00 x10 <sup>-3</sup> Ni 6.28 x10 <sup>-2</sup>	59,097 12.9% 371 °F 4%	4.6 - 5.9  Avg=5.1	2.0 - 3.7  Avg =2.7	TBC=11  Mod.Off = none
11/24/98  front-half PM	9.86  4.13 42%	<b>0.41</b>  0.17	0.81  0.34	63,314 14.3% 356 °F nr	5.4 - 5.6  Avg=5.5	2.1 - 2.7  Avg =2.3	TBC=?  Mod.Off = none
11/20/96  front-half PM	3.04  0.74 24%	<b>0.12</b>  0.03	0.23  0.06	49,261 8.7% 424 °F 0%	3.4 - 3.4  Avg=3.4	1.2 - 2.9  Avg =2.3	?  Mod.Off = none
10/15/92 only front- half PM measured	0.79	0.03	0.07	35,396 8.8% 338 °F nr	nr	nr	nr

Notes The term "Mod. Off" means indicates the name of the baghouse modules closed off during the test.  
nr means value not reported.

# ROCKWELL LIME COMPANY

Lynda Lund  
AM7

4110 Rockwood Rd., Manitowoc, WI 54220-9619

920-682-7771 • 1-800-558-7711 • Fax: 920-682-7972

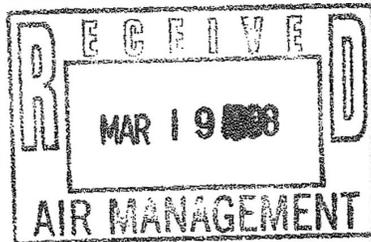
RECEIVED DNR

January 26, 1998

JAN 28 1998

NORTHEAST REGION

Mr. Jim Crawford, P.E.  
Bureau of Air Management, WI DNR  
1125 North Military Ave.  
P.O. Box 10448  
Green Bay, WI 54307-0448



Dear Mr. Crawford,

This letter represents both the annual reporting and certification requirements which are part of our air permit #93-RV-108. This report covers the time period from January 1, 1997 to December 31, 1997.

Permit Condition	Permit Limit	Avg.	Min.	Max.	Comments
Sulfur	147# / Hr	127.89	0.3	146.33	
SO <sub>2</sub>	5.5# / MMBTU	3.04	0.01	4.06	
Baghouse Stack Visual Emissions	10 % Opacity	~4%	0%	15%	All opacity readings in excess of 10% were reported on quarterly CEM reports
Baghouse Inlet Pressure	0.5" - 8" Water	6.28	1.6	8.0	
Conveying Equip. Visual Emissions	5% Opacity	0%	0%	0%	No visual emissions were noted from these sources
Particulate Matter	0.3# / Ton of Stone Feed	0.12	0.07	0.2	Stack Test Results 11/20/96

The baghouse was in operation whenever the #2 kiln was operating.

CORRESPONDENCE/ MEMORANDUM

DATE: May 25, 1999

File Code: 4530

Informational Test  
PRELIMINARY STACK TEST REVIEW

By: Jeanine Campion

Test Date: April 7, 1999

Name of Source: Rockwell Lime

FID #: 436-034-390

Address: 4110 Rockwood Road Stack #: S11

City: Manitowoc Process #: P36

Permit #: 93-RV-108 Date Issued: Feb 7, 1995

Description of Source Tested: Limestone Quarry (Lime Kiln)

Description of Control Equipment: Baghouse

Test Firm: EMT

Crew Chief & Phone#: Jay Whitaker (847) 967-6666

Pollutant Tested: Metals Test Method: 29

Pollutant Tested: \_\_\_\_\_ Test Method: \_\_\_\_\_

Pollutant Tested: \_\_\_\_\_ Test Method: \_\_\_\_\_

Test Production Level: AW 27.64 tons stone/hr

Rated Production Level: 25 tons stone/hr

Discussion of Results:

<u>mm</u>	Poll. Test Ave. = $5.86 \times 10^{-5}$ lb/ton stone	Limit = <u>for information only</u>	In Compliance? Y N
<u>crystallium</u>	Poll. Test Ave. = $1.74 \times 10^{-6}$ lb/ton stone	Limit = <u>for information only</u>	In Compliance? Y N
<u>ad</u>	Poll. Test Ave. = $8.42 \times 10^{-5}$ lb/ton stone	Limit = <u>for information only</u>	In Compliance? Y N
<u>arsenic</u>	Poll. Test Ave. = $5.01 \times 10^{-4}$ lb/ton stone	Limit = <u>for information only</u>	In Compliance? Y N
<u>nickel</u>	Poll. Test Ave. = $3.14 \times 10^{-2}$ lb/ton stone	Limit = <u>250 lb/hr</u>	In Compliance? Y N <u>NR 445 Table</u>

Is This a Valid Test? Y N If answer is no, please indicate the reason.

\* Test may be reviewed in depth later, if necessary.

CC Joe Perez - AM/7  
US EPA Region V

**SUMMARY TABLE #1 - LIME KILN EXHAUST METALS RESULTS**

COMPANY: Rockwell Lime Company  
 LOCATION: Manitowoc, WI (Rockwood)  
 SOURCE: Lime Kiln Exhaust  
 TEST DATE: 4-7-99

TEST RUN	1	2	3	AVERAGE
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**GAS PARAMETERS**

Velocity (ft/sec)	34.5	37.4	35.5	35.8
Volume flow (acfm)	56891.6	61756.7	58642.5	59097.0
Volume flow (scfh, wb)	2112168.2	2333283.2	2250051.5	2231834.3
Volume flow (dscfh)	1993962.4	2189736.1	2116477.5	2100058.7
Temperature (deg. F)	384.7	370.0	357.3	370.7
Oxygen (%)	13.2	12.5	13.0	12.9
Carbon Dioxide (%)	15.3	15.2	15.5	15.3
Moisture (% by volume)	5.6	6.2	5.9	5.9

**METALS SAMPLE**

Sample Volume (dscf)	41.302 ✓	43.811 ✓	42.523 ✓	
Isokinetic	103.3 ✓	99.8 100, 2	100.2 100.0	

**METALS EMISSIONS RATES**

Barium (lb/hr)	1.28E-03	1.76E-03 *	1.76E-03 *	1.60E-03
Beryllium (lb/hr)	3.73E-05 *	3.86E-05 *	6.58E-05 *	4.72E-05
Lead (lb/hr)	2.29E-03 *	2.76E-03 *	1.92E-03 *	2.32E-03
Manganese (lb/hr)	3.14E-03	1.86E-02	1.84E-02	1.34E-02
Nickel (lb/hr)	4.26E-03	1.27E+00	1.22E+00	8.31E-01 (*)
Barium (lb/Ton Stone Feed)	4.28E-05	6.51E-05 *	6.78E-05 *	5.86E-05
Beryllium (lb/Ton Stone Feed)	1.25E-06 *	1.43E-06 *	2.54E-06 *	1.74E-06
Lead (lb/Ton Stone Feed)	7.65E-05 *	1.02E-04 *	7.40E-05 *	8.42E-05
Manganese (lb/Ton Stone Feed)	1.05E-04	6.88E-04	7.09E-04	5.01E-04
Nickel (lb/Ton Stone Feed)	1.42E-04	4.70E-02	4.70E-02	3.14E-02 (*)

⊗ Above NR445 Threshold of 250 lb/yr

**PROCESS DATA**

Stone Feed (Tons/hr)	29.94	27.05	25.94	27.64
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\* Indicates that a portion of, or the entire result is calculated at the detection limit, actual result is lower.

## SUMMARY TABLE #1 - LIME KILN EXHAUST METALS RESULTS

COMPANY: Rockwell Lime Company  
 LOCATION: Manitowoc, WI (Rockwood)  
 SOURCE: Lime Kiln Exhaust  
 TEST DATE: 4-7-99

TEST RUN	1	2	3	AVERAGE
<b>GAS PARAMETERS</b>				
Velocity (ft/sec)	34.5	37.4	35.5 *	35.8
Volume flow (acfm)	56891.6	61756.7	58642.5	59097.0
Volume flow (scfh, wb)	2112168.2	2333283.2	2250051.5	2231834.3
Volume flow (dscfh)	1993962.4	2189736.1	2116477.5	2100058.7
Temperature (deg. F)	384.7	370.0	357.3	370.7
Oxygen (%)	13.2	12.5	13.0	12.9
Carbon Dioxide (%)	15.3	15.2	15.5	15.3
Moisture (% by volume)	5.6	6.2	5.9	5.9
<b>METALS SAMPLE</b>				
Sample Volume (dscf)	41.302 ✓	43.811 ✓	42.523 ✓	
Isokinetic	103.3 ✓	<del>98.8</del> 100, 2	<del>100.2</del> 100.6	
<b>METALS EMISSIONS RATES</b>				
Barium (lb/hr)	1.28E-03	1.76E-03 *	1.76E-03 *	1.60E-03
Beryllium (lb/hr)	3.73E-05 *	3.86E-05 *	6.58E-05 *	4.72E-05
Lead (lb/hr)	2.29E-03 *	2.76E-03 *	1.92E-03 *	2.32E-03
Manganese (lb/hr)	3.14E-03	1.86E-02	1.84E-02	1.34E-02
Nickel (lb/hr)	4.26E-03	1.27E+00	1.22E+00	8.31E-01 (*)
Barium (lb/Ton Stone Feed)	4.28E-05	6.51E-05 *	6.78E-05 *	5.86E-05
Beryllium (lb/Ton Stone Feed)	1.25E-06 *	1.43E-06 *	2.54E-06 *	1.74E-06
Lead (lb/Ton Stone Feed)	7.65E-05 *	1.02E-04 *	7.40E-05 *	8.42E-05
Manganese (lb/Ton Stone Feed)	1.05E-04	6.88E-04	7.09E-04	5.01E-04
Nickel (lb/Ton Stone Feed)	1.42E-04	4.70E-02	4.70E-02	3.14E-02 (*)
⊗ Above NR 445 threshold of 250 lb/yr				
<b>PROCESS DATA</b>				
Stone Feed (Tons/hr)	29.94	27.05	25.94	27.64

\* Indicates that a portion of, or the entire result is calculated at the detection limit, actual result is lower.

METALS CHECKLIST

Name of Source: Rockwell Lime Test Date: April 8 1999

Metals Tested: Barium, Beryllium, Lead, Manganese + Nickel

1. Are the isokinetics per run between 90 and 110%? YES  NO   
If the XI for a run is outside the range, void the run. See 5.
2. Is the sample volume per run  $\geq 30$  DSCF? YES  NO   
If the sample volume for a run is  $< 30$  DSCF, void the run. See 5.
3. Is the sample time per run  $\geq 60$  min.? YES  NO   
If the sample time for a run is  $< 60$  min., void the run. See 5.
4. Is the sample time per sample point  $\geq$  two min.? YES  NO   
If the sample time per point for a run is  $<$  two min., void the run. See 5.
5. A stack test shall consist of three valid runs or, at a minimum, two valid runs if one run is voided. Is this a valid test? YES  NO   
If no, inform the District or the source that the test is unacceptable and should be redone. Your review is over.

Eq. 1  $\text{mg/DSCM} = \text{mg of metal/sample volume of the run in DSCM}$

Eq. 2  $\text{Lb/DSCF} = 6.243 \times 10^{-4} * (\text{mg/DSCM})$

Eq. 3  $\text{mg/DSCF} = \text{mg of metal/sample volume of the run in DSCF}$

Eq. 4  $\text{Lb/DSCF} = 2.205 \times 10^{-4} * (\text{mg/DSCF})$

Eq. 5  $\text{Lb/Hr} = 60 * \text{DSCFM} * (\text{Lb/DSCF})$  Eq. 6  $\text{Lb/Yr} = (\text{Lb/Hr}) * 24 * 365$

Eq. 7  $\text{Gr/Hr} = 7000 * (\text{Lb/Hr})$

6. If the emission limit is in mg/DSCM, Lb/DSCF, Lb/Hr, Lb/Yr or Gr/Hr solve Eq. 1-7. Do your results match the consultant's? YES  NO   
If no, fix the problem or call the consultant for a correction. N/A

7. Is the three run (or two run) average correct? YES  NO   
If no, write in the correct average.

8. Is the average result in compliance? (for Nickel - see below) YES  NO   
If no, the District should issue an NOV.

9. Was the source operating at a level representative of full capacity? YES  NO   
If no, the permit release may need to provide conditions to cap the source at the test level until a stack test at a higher production level (showing compliance) is performed. If the test was not for permit release, other actions may be warranted.

*tested for compliance  
Nickel was the only metal*

$$i \text{ lb/yr} = (3.14 \times 10^{-2} \text{ lb/ton stack}) (194,468 \text{ tons/yr}) = \boxed{6,106.30 \text{ lb Ni/yr}}$$

NR 445 Table 3 Threshold =  $\boxed{2,500 \text{ lb Ni/yr}}$   $\therefore$  Not in compliance

*based on 1997 data*

## Environmental Monitoring &amp; Technologies, Inc.

## SUMMARY TABLE #2 - PROCESS DATA / SUPPLEMENTARY RESULTS

Company: Rockwell Lime Company  
 Location: Rockwood, WI  
 Source: Lime Kiln Exhaust  
 Run #: 1-3  
 Date: 4-7-99

## Manufacturing Data Compiled During EMT's Stack Test on #2 Kiln

Test Run	Time	Natural Gas (CF)	Coal/Coke Blend (Lbs)	Stone Feed (Tons)	Baghouse Pressure Differential Readings Across Each Compartment							
					#1	#2	#3	#4	#5	#6	#7	#8
#1	0856 - 1018	23,500	6,796	29.94	2.4	2.5	2.6	2.5	2.3	2.0	2.7	2.6
#2	1104 - 1215	24,400	6,054	27.04	2.3	2.2	2.8	2.8	2.5	2.6	2.6	2.4
#3	1235 - 1343	23,400	5,798	25.94	2.6	2.6	2.7	3.4	3.6	3.7	2.9	3.0

## SUMMARY TABLE #1 - LIME KILN EXHAUST METALS RESULTS

COMPANY: Rockwell Lime Company  
 LOCATION: Manitowoc, WI (Rockwood)  
 SOURCE: Lime Kiln Exhaust  
 TEST DATE: 4-7-99

TEST RUN	1	2	3	AVERAGE
<b>GAS PARAMETERS</b>				
Velocity (ft/sec)	34.5	37.4	35.5	35.8
Volume flow (acfm)	56891.6	61756.7	58642.5	59097.0
Volume flow (scfh, wb)	2112168.2	2333283.2	2250051.5	2231834.3
Volume flow (dscfh)	1993962.4	2189736.1	2116477.5	2100058.7
Temperature (deg. F)	384.7	370.0	357.3	370.7
Oxygen (%)	13.2	12.5	13.0	12.9
Carbon Dioxide (%)	15.3	15.2	15.5	15.3
Moisture (% by volume)	5.6	6.2	5.9	5.9
<b>METALS SAMPLE</b>				
Sample Volume (dscf)	41.302 ✓	43.811 ✓	42.523 ✓	
Isokinetic	103.3 ✓	99.8 100.2	100.2 100.0	
<b>METALS EMISSIONS RATES</b>				
Barium (lb/hr)	1.28E-03	1.76E-03 *	1.76E-03 *	1.60E-03
Beryllium (lb/hr)	3.73E-05 *	3.86E-05 *	6.58E-05 *	4.72E-05
Lead (lb/hr)	2.29E-03 *	2.76E-03 *	1.92E-03 *	2.32E-03
Manganese (lb/hr)	3.14E-03	1.86E-02	1.84E-02	1.34E-02
Nickel (lb/hr)	4.26E-03	1.27E+00	1.22E+00	8.31E-01 (*)
Barium (lb/Ton Stone Feed)	4.28E-05	6.51E-05 *	6.78E-05 *	5.86E-05
Beryllium (lb/Ton Stone Feed)	1.25E-06 *	1.43E-06 *	2.54E-06 *	1.74E-06
Lead (lb/Ton Stone Feed)	7.65E-05 *	1.02E-04 *	7.40E-05 *	8.42E-05
Manganese (lb/Ton Stone Feed)	1.05E-04	6.88E-04	7.09E-04	5.01E-04
Nickel (lb/Ton Stone Feed)	1.42E-04	4.70E-02	4.70E-02	3.14E-02 (*)
* Above NR445 threshold of 250 lb/yr				
<b>PROCESS DATA</b>				
Stone Feed (Tons/hr)	29.94	27.05	25.94	27.64

\* Indicates that a portion of, or the entire result is calculated at the detection limit, actual result is lower.

Stack11/Process36				
Method 29 - Metals				
	Run: 1	Run: 2	Run: 3	
Barometric Pressure (PB):	29.63	29.63	29.63	Inches Hg
Stack Static Pressure:	-0.16	-0.18	-0.18	Inches H2O
Stack Pressure (PS):	29.62	29.62	29.62	Inches Hg
Orifice Pressure (OP) or delta H:	1.62	1.92	1.79	Inches Hg Abs.
Volume H2O CONDENSED (VLc):	42	52	48	mL condensed
Volume H2O in SILICA GEL (VLsg):	10	9	9	mL in silica gel
Total Volume H2O in impingers (VL):	52	61	57	mL total
Total particulate mass (MT):				Grams
Test Time (T):	60	60	60	Minutes
Number of Points:	24	24	24	Points
Time per point:	2.5	2.5	2.5	Minutes
% O2:	13.2	12.5	13	%
% CO2:	15.3	15.2	15.5	%
% N2:	71.5	72.3	71.5	%
Pitot tube coefficient (CP):	0.84	0.84	0.84	(dimensionless)
Stack Temperature Avg. (TS):	385	370	357	Deg. F
Stack Temperature (TS): Rankine	844	830	817	Deg. R
Meter Temperature Avg. (TM):	57	60	59	Deg. F
Meter Temperature (TM): Rankine	517	520	519	Deg. R
Gas Meter Volume (VM):	40.64	43.31	41.97	Cubic Feet
Nozzle Diameter:	0.318	0.318	0.318	Inches
Nozzle Area (AN):	5.52E-04	5.52E-04	5.52E-04	Square Feet
Stack Area (AS):	27.49	27.49	27.49	Square Feet
Dry Gas Meter correction factor (Y):	1.002	1.002	1.002	(dimensionless)
F-factor:				DSCF/10^6 BTU
Sqr Rt Velocity Pressure Avg (VP^0.5):	0.49	0.54	0.52	Inches H2O
Heat Input (HI):				MMBTU/Hr
Dry Gas Meter Volume (VMSTD):	41.3	43.8	42.5	Dry Standard Cubic Feet
Condensed H2O Volume (VWSTD):	2.448	2.872	2.684	Wet Standard Cubic Feet
% Moisture:	5.6	6.1	5.9	%
Mole Fraction (MD):	0.944	0.939	0.941	Fraction
Dry Molecular Weight (MWD):	31.0	30.9	31.0	Lb/Lb-mole dry stack gas
Wet Molecular Weight (MWS):	30.3	30.1	30.2	Lb/Lb-mole wet stack gas
Stack Gas Velocity Avg (VS):	34.5	37.3	35.4	Feet/Second
Actual Stack Flow Rate (QACT):	56881	61506	58405	ACF/M
Dry Stack Flow Rate (QSTD):	33219	36340	35127	DSCF/M
% Excess Air	233	190	221	%
Part. Mass Rate-Areas Method (PMRA):				Lbs/Hr
Part. Mass Rate-Conc. Method (PMRC):				Lbs/Hr
Part. Mass Rate-Average (PMRAVG):				Lbs/Hr
Part. Emission Concentration (C):				GR/DSCF
Emission rate Avg (E):				lb/10^6 BTU Input
Dry Stack Gas Mass Flow Rate (DGR):	160118	174914	169445	lbs. of dry gas/hr
Emission Rate Avg-dry gas (LB/MLBD):				lb/10^3 lb of dry gas
Wet Stack Gas Mass Flow Rate (WGR):	156463	170523	165332	lb of wet gas/hr
Emission Rate Avg-wet gas (LB/MLBW):				lb/10^3 of wet gas
Emission Rate by Fuel Factor (EF):				lb/10^6 BTU Input
EF (fronthalf only)	#VALUE!	#VALUE!	#VALUE!	lb/10^6 BTU Input
% Isokinetics (90% < Iso < 110%)	103.3	100.2	100.6	%

CORRESPONDENCE/MEMORANDUM

DATE: July 6, 1999

File Code: 4530

PRELIMINARY STACK TEST REVIEW

Received: 7/2/99

By: Jeannine Campion Test Date: June 17, 1999

Name of Source: Rockwell Lime, #2 FID #: 430-034-390

Address: 4110 Rockwood Rd Stack #: S11

City: Manitowoc, WI 54220-9619 Process #: P36

Permit #: 93-RV-108 Date Issued: February 7, 1995

Description of Source Tested: Lime Kiln #2

Description of Control Equipment: Baghouse

Test Firm: Clean Air Engineering  
Crew Chief & Phone#: Peter Kaufmann (847) 991-3300

Pollutant Tested: PM Test Method: 5/202  
Pollutant Tested: \_\_\_\_\_ Test Method: \_\_\_\_\_  
Pollutant Tested: \_\_\_\_\_ Test Method: \_\_\_\_\_

Test Production Level: 25.46 tons of stone feed  
Rated Production Level: 25 tons of stone feed

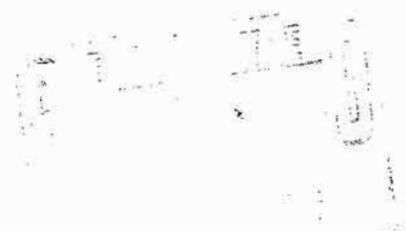
Discussion of Results:

Poll. Test Ave. =	<u>0.021 lb/ton stone</u>	Limit =	<u>0.30 lb/ton stone</u>	In Compliance? <input checked="" type="radio"/> Y <input type="radio"/> N
Poll. Test Ave. =	_____	Limit =	_____	In Compliance? Y N
Poll. Test Ave. =	_____	Limit =	_____	In Compliance? Y N
Poll. Test Ave. =	_____	Limit =	_____	In Compliance? Y N

Is This a Valid Test?  Y  N If answer is no, please indicate the reason.

\* Test may be reviewed in depth later, if necessary.

CC Joe Perez - AM/7  
US EPA Region V



PARTICULATE CHECKLIST

Name of Source: R. Kwell Lime Test ce: June 17, 1999

1. Are the isokinetics per run between 90 and 110%? YES  NO   
If the  $\%I$  for a run is outside the range, void the run. See 5.
2. Is the sample volume per run  $\geq 30$  DSCF? YES  NO   
If the sample volume for a run is  $< 30$  DSCF, void the run. See 5.
3. Is the sample time per run  $\geq 60$  min.? YES  NO   
If the sample time for a run is  $< 60$  min., void the run. See 5.
4. Is the sample time per sample point  $\geq$  two min.? YES  NO   
If the sample time per point for a run is  $< 2$  min., void the run. See 5.
5. A stack test shall consist of three valid runs or, at a minimum, two valid runs if one run is voided. Is this a valid test? YES  NO   
If no, inform the District or the source that the test is unacceptable and should be redone. Your review is over.
6. Is the total particulate per run added correctly? YES  NO   
If an incorrect total is found, correct the total and the results or call the consultant and ask for a correction.
7. Was the backhalf included in the total particulate? YES  NO   
NSPS sources are exempt from including the backhalf. All other sources must include the backhalf. If they don't, the test is invalid. See 5.

Eq. 1  $Gr/DSCF = 15.43 * g \text{ of part./sample volume of run in DSCF}$

Eq. 2  $Gr/DSCF @ 12\% CO_2 = (Gr/DSCF) * 12 / \text{Stack } CO_2$

Eq. 3  $Gr/DSCF @ 7\% O_2 = (Gr/DSCF) * (20.9 - 7) / (20.9 - \text{Stack } O_2)$

Eq. 4  $Lb/DSCF = (Gr/DSCF) / 7000$     Eq. 5  $Lb/MLb_{DRY} = 385.6 * 10^3 * (Lb/DSCF) / MW_{DRY}$

Eq. 6  $Lb/MLb_{WET} = 385.6 * 10^3 * (Lb/DSCF) * (1 - (\% \text{ Moisture} / 100)) / MW_{WET}$

Eq. 7  $Lb/Hr = 60 * DSCFM * (Lb/DSCF)$     Eq. 8  $Lb/10^6 \text{ BTU} = (Lb/Hr) / (10^6 \text{ BTU/Hr})$

Eq. 9  $Lb/10^6 \text{ BTU} = (Lb/DSCF) * F \text{ Factor} * 20.9 / (20.9 - \text{Stack } O_2)$

8. If the emission limit is in Gr/DSCF, Lb/DSCF, Lb/MLb, Lb/Hr or Lb/10<sup>6</sup> BTU, solve the needed Eq. Do your results match the consultant's? YES  NO   
If no, fix the problem or call the consultant for a correction.
9. Is the three run (or two run) average correct? YES  NO   
If no, write in the correct average.
10. Is the average result in compliance? YES  NO   
If no, the District should issue an NOV.
11. Was the source operating at a level representative of full capacity? YES  NO   
If no, the permit release may need to provide conditions to cap the source at the test level until a stack test at a higher production level (showing compliance) is performed. If the test was not for permit release, other actions may be warranted.

S11/P36				
Method 5/202 - Particulates				
	Run: 1	Run: 2	Run: 3	
Barometric Pressure (PB):	29.55	29.55	29.55	Inches Hg
Stack Static Pressure:	-0.1	-0.1	-0.1	Inches H2O
Stack Pressure (PS):	29.54	29.54	29.54	Inches Hg
Orifice Pressure (OP) or delta H:	1.10	1.17	1.01	Inches Hg Abs.
Volume H2O CONDENSED (VLc):				mL condensed
Volume H2O in SILICA GEL (VLsg):	60.3	63.2	58.4	mL in silica gel
Total Volume H2O in impingers (VL):	60.3	63.2	58.4	mL total
Total particulate mass (MT):	0.0049	0.0015	0.0079	Grams
Test Time (T):	60	60	60	Minutes
Number of Points:	24	24	24	Points
Time per point:	2.5	2.5	2.5	Minutes
% O2:	7.1	7.3	7.3	%
% CO2:	21.2	21.2	21.3	%
% N2:	71.7	71.5	71.4	%
Pitot tube coefficient (CP):	0.84	0.84	0.84	(dimensionless)
Stack Temperature Avg. (TS):	419	420	426	Deg. F
Stack Temperature (TS): Rankine	879	880	886	Deg. R
Meter Temperature Avg. (TM):	84	92	96	Deg. F
Meter Temperature (TM): Rankine	544	552	556	Deg. R
Gas Meter Volume (VM):	34.92	36.06	33.88	Cubic Feet
Nozzle Diameter:	0.32	0.32	0.32	Inches
Nozzle Area (AN):	5.59E-04	5.59E-04	5.59E-04	Square Feet
Stack Area (AS):	27.49	27.49	27.49	Square Feet
Dry Gas Meter correction factor (Y):	0.9973	0.9973	0.9973	(dimensionless)
F-factor:				DSCF/10 <sup>6</sup> BTU
Sqr Rt Velocity Pressure Avg (VP <sup>0.5</sup> ):	0.42	0.43	0.40	Inches H2O
Heat Input (H):				MMBTU/Hr

Dry Gas Meter Volume (VMSTD):	33.5	34.0	31.8	Dry Standard Cubic Feet
Condensed H2O Volume (VWSTD):	2.843	2.980	2.754	Wet Standard Cubic Feet
% Moisture:	7.8	8.0	8.0	%
Mole Fraction (MD):	0.922	0.920	0.920	Fraction
Dry Molecular Weight (MWD):	31.7	31.7	31.7	Lb/Lb-mole dry stack gas
Wet Molecular Weight (MWS):	30.6	30.6	30.6	Lb/Lb-mole wet stack gas
Stack Gas Velocity Avg (VS):	29.4	30.2	28.3	Feet/Second
Actual Stack Flow Rate (QACT):	48532	49868	46709	ACF/M
Dry Stack Flow Rate (QSTD):	26517	27154	25280	DSCF/M
% Excess Air	60	63	63	%
Part. Mass Rate-Areas Method (PMRA):	0.53	0.16	0.86	Lbs/Hr
Part. Mass Rate-Conc. Method (PMRC):	0.51	0.16	0.83	Lbs/Hr
Part. Mass Rate-Average (PMRAVG):	0.52	0.16	0.84	Lbs/Hr
Part. Emission Concentration (C):	0.0023	0.0007	0.0038	GR/DSCF
Dry Stack Gas Mass Flow Rate (DGR):	130703	133874	124698	lbs. of dry gas/hr
Emission Rate Avg-dry gas (LB/MLBD):	0.004	0.001	0.007	lb/10 <sup>3</sup> lb of dry gas
Wet Stack Gas Mass Flow Rate (WGR):	126363	129301	120475	lb of wet gas/hr
Emission Rate Avg-wet gas (LB/MLBW):	0.004	0.001	0.007	lb/10 <sup>3</sup> of wet gas
% Isokinetics (90% < Iso < 110%)	103.5	102.8	103.1	%

Method 5/202 - Particulates		Checklist		
		Run: 1	Run: 2	Run: 3
Isokinetics		Good	Good	Good
Sample Volume (dscf)		Good	Good	Good
Sample Time	Per run:	Good	Good	Good
	Per point:	Good	Good	Good
Operating at Full Capacity?		Yes	Yes	Yes
Compliance		No		unknown unit

Permit # and Date	93-RV-108	2/7/95
Limit or Regulation	0.300	lb/ ton of stone feed

Production Data:				
Rated Full Capacity	25			tons of stone feed
Operating Rate during test	25.74	25.22	25.44	tons of stone feed
Percent of Full Capacity	103.0	100.9	101.8	% of rated full capacity

Compliance determination for PM:

Run #1: 0.022 lb PM/ton stone feed  
 Run #2: 0.0068 lb PM/ton stone feed  
 Run #3: 0.034 lb PM/ton stone feed

Average: 0.021 lb PM/ton stone feed

# Rockwell Lime Company

Manufacturing Data Compiled During CAE's Stack Test on #2 Kiln

08/18/99 FRI 15:34 FAX 920 882 75

ROCKWELL LIME

002

## articulate Test

Test Run	Date	Time	Nat. Gas (CF)	Coal/Coke Blend (Lbs)	Stone Feed (Tons)	Baghouse Pressure Differential Readings Across Each Compartment							
						#1	#2	#3	#4	#5	#6	#7	#8
1	08/18/99	08:01 am - 09:05 am	22,800	5,338	25.74	4.1	Off	3.8	4.8	Off	4.5	Off	4.1
2	08/18/99	09:25 am - 10:27 am	22,300	5,268	25.24	5.2	Off	5.1	5.3	Off	4.2	Off	4.5
3	08/18/99	10:49 am - 11:50 am	22,500	5,317	25.44	4.3	Off	4.0	5.5	Off	4.9	Off	3.9

Opacity CEM read "0-3%" throughout the entire test.  
Baghouse Inlet pressure during tests ranged between 6.3" - 7.0"

**RESULTS**

2-1

**Table 2-1:  
 Kiln #2, Baghouse Stack - Particulate**

Run No.		1	2	3	Average
Date (1999)		June 18	June 18	June 18	
Start Time (approx.)		08:00	09:25	10:49	
Stop Time (approx.)		09:05	10:27	11:51	
<b>Process Conditions<sup>1</sup></b>					
	Stone Feed (tons)	25.74	25.24	25.44	25.47
	Stone Feed (ton/hr)	24.13	24.43	25.02	24.53
<b>Gas Conditions</b>					
O <sub>2</sub>	Oxygen (dry volume %)	7.1	7.3	7.3	7.2
CO <sub>2</sub>	Carbon dioxide (dry volume %)	21.2	21.2	21.3	21.2
T <sub>s</sub>	Temperature (°F)	419	420	426	422
B <sub>vo</sub>	Moisture (volume %)	7.82	8.04	7.97	7.94
<b>Volumetric Flow Rate</b>					
Q <sub>a</sub>	Actual conditions (acfm)	49,920	51,300	48,050	49,760
Q <sub>std</sub>	Standard conditions (dscfm)	27,280	27,930	26,000	27,070
<b>Front Half Particulate</b>					
C	Concentration (gr/acf)	0.00071	0.00011	0.00017	0.00033
C	Concentration (gr/dscf)	0.0013	0.00020	0.00031	0.00060
E	Emission rate (lb/hr)	0.31	0.047	0.069	0.14
E	Emission rate (lb/ton stone)	0.013	0.0019	0.0027	0.0058
<b>Back Half Particulate</b>					
C	Concentration (gr/acf)	0.0005	0.0003	0.0019	0.0009
C	Concentration (gr/dscf)	0.0010	0.0005	0.0035	0.0017
E	Emission rate (lb/hr)	0.22	0.119	0.79	0.38
E	Emission rate (lb/ton stone)	0.0093	0.0049	0.031	0.015
<b>Total Particulate</b>					
C	Concentration (gr/acf)	0.0012	0.00038	0.0021	0.0012
C	Concentration (gr/dscf)	0.0023	0.00069	0.0038	0.0023
E	Emission rate (lb/hr)	0.53	0.17	0.85	0.52
E	Emission rate (lb/ton stone)	0.022	0.0068	0.034	0.021

<sup>1</sup> Process conditions supplied by Rockwell Lime Company personnel.



## PROJECT OVERVIEW

1-1

Rockwell Lime Company contracted Clean Air Engineering to perform particulate testing at their facility located in Manitowoc, Wisconsin for compliance demonstration.

The test parameters included the following pollutants:

- Total suspended particulate (TSP).

Prior to the sampling, the alternative measurement site selection procedures (Section 2.5 of EPA Method 1) was performed to determine the presence of cyclonic flow. EPA Method 202 was performed as per the method since the 3D measurement indicated no cyclonic flow.

The testing was conducted place at the No. 2 Kiln Baghouse Stack on June 18, 1999. Coordinating the field testing were:

Don Brisch - Rockwell Lime  
Peter Kaufmann - Clean Air Engineering

Observing the metals testing was:

Jeannine M. Campion- Wisconsin DNR

The schedule of activities shown in Table 1-1. A summary of the results is presented in Table 1-2 on page 1-2.



**PROJECT OVERVIEW**

**Table 1-1:  
 Schedule of Activities**

<u>Date(1999)</u>	<u>Start Time</u>	<u>Stop Time</u>	<u>Unit</u>	<u>Location</u>	<u>Pollutant</u>	<u>Method</u>	<u>Run No.</u>
<u>June 18</u>							
	08:00	09:05	Kiln #2	Stack	Particulate	EPA 202	1
	09:25	10:27	Kiln #2	Stack	Particulate	EPA 202	2
	10:49	11:51	Kiln #2	Stack	Particulate	EPA 202	3

**Table 1-2:  
 Summary of Test Results**

<u>Source</u> Constituent (Units)	<u>Sampling Method</u>	<u>Average Emission</u>
<u>Kiln #2</u>		
Particulate (lb/hr)	EPA M202	0.52
Particulate (lb/ton stone)	EPA M202	0.021
<u>Source</u> Constituent (Units)	<u>Sampling Method</u>	<u>Resultant Angle</u>
Cyclonic Flow (Resultant angle)	EPA M1 Sect 2.5	6.2

The test conditions and results of analysis are presented in Table 2-1 on page 2-1.

